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ABSTRACT

This booklet on gardening techniques uses methods that have been successful for other teachers. The activities are interdisciplinary and encourage positive attitudes toward proper uses for the land, and the importance of the farm or agriculture as a basic unit of modern life. (Author/RH)

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GARDENING

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on campus

LEE COUNTY SCHOOLS

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INTRODUCTION

Why garden? Why give students the opportunity to participate in gardening activities? The answers to these questions lie in the recent history of the social and economic changes that have taken place in the United States. The movement of people from a rural to urban and suburban environments is a basic factor for justifying gardening activities in the school curriculum. As student populations continue to become more urbanized, students, as well as teachers, tend to lose sight of the art and importance of farming. Many students in the early elementary levels actually believe or assume that vegetables are produced in the supermarket. Land has become just another commodity to be bought and sold to the highest bidder with no thought to land use and its relationship to the production of food stuffs.

Gardening activities are interdisciplinary, and tend to form positive attitudes toward proper uses for the land and the importance of the farm or agriculture as a basic unit of modern life. Gardening is not passive and text oriented, but is a "hands on" experience that allows the student to become involved. This involvement can be used as an impetus for reading, science, social studies, math, language arts, music, art, industrial arts, health, and career education activities.

This booklet deals with gardening techniques and methods that have been successful for other teachers.

The only way for you and your class to succeed is to begin. This guide provides you support on your first step. If you have questions or apprehensions, call the Environmental Education Center or any of the cooperating garden centers listed in the Appendix.

CAMPUS VEGETABLE GARDEN

A student developed and maintained vegetable garden becomes an effective and practical teaching tool. Garden sections can be divided so that individuals or entire classrooms are responsible for the planting and cultivation of a specific area. Most students will work with pride, and all eagerly anticipate the harvest. The garden produce can be taken home or prepared by the school cafeteria as a lunch treat.

I. Choosing a site - Give your students these specifications and allow them to search for and locate a site:

   A. The site for a garden on the campus should be chosen away from normal student traffic routes.

   B. Select a sunny site. Full sun is best. If this is not available, the site should have at least 5 to 6 hours of full sun. If the site

by necessity is going to be in the shade part of the day, a garden receiving morning sun is best, as it dries your plants off early in the day and helps to prevent diseases.

C. The site should be well drained and should not flood during heavy rains. If drainage is poor, the beds will have to be raised.

D. Be certain that a water source is nearby. You will need a hose and sprinkler for the garden.

E. Don't worry about poor soil. Most South Florida soils are very poor, but you will be improving the soil of your garden by adding organic material and soil conditioners. A good garden can be grown any place where weeds or grasses grow. Bringing in a load of rich topsoil for your garden may be helpful, but it is certainly not necessary. (See the section concerning Composting.)

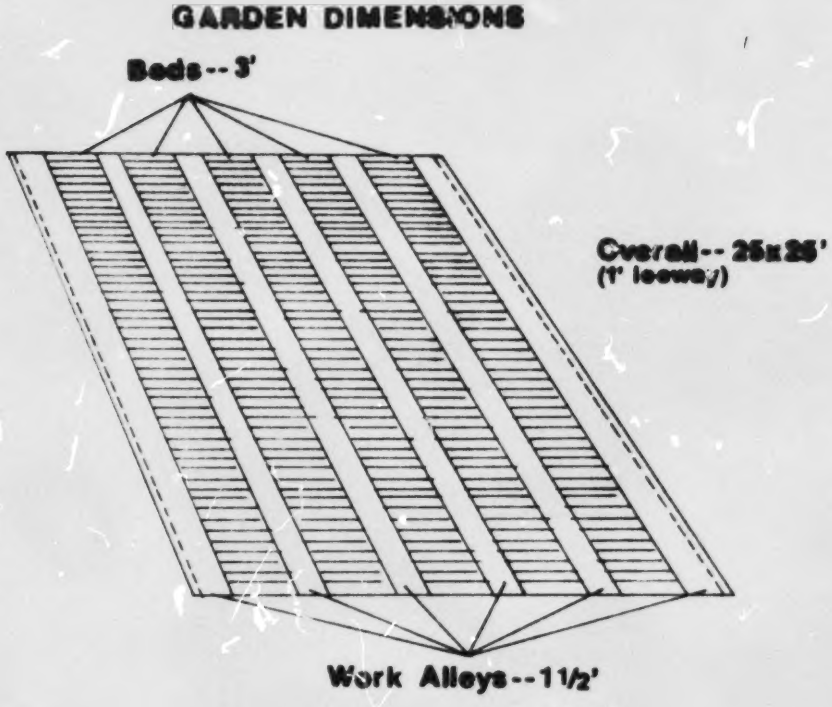
II. Arriving at a Size:

A. The size of a garden will vary according to how many classes or students participate. An average size garden adequate for most schools requires a minimum space allotment of 25' X 25'. The amount of materials, seeds, soil conditioners, etc. cited within this booklet is estimated for a garden of these dimensions. If you increase or decrease the size of your garden, you will need to alter the material allotment accordingly.

B. With a garden 25' X 25', five rows of vegetable beds (each 3' wide) should be adequate. Allow for six 18" alleys between the rows, from which the students will work. (See drawing on following page.)

C. In advance of any soil preparation, define these beds and work alleys with string so that peat moss and fertilizer will not be wasted on alleys. Another method of spacing rows is to allow as much space

between the rows as equals the height of the plants when fully grown.



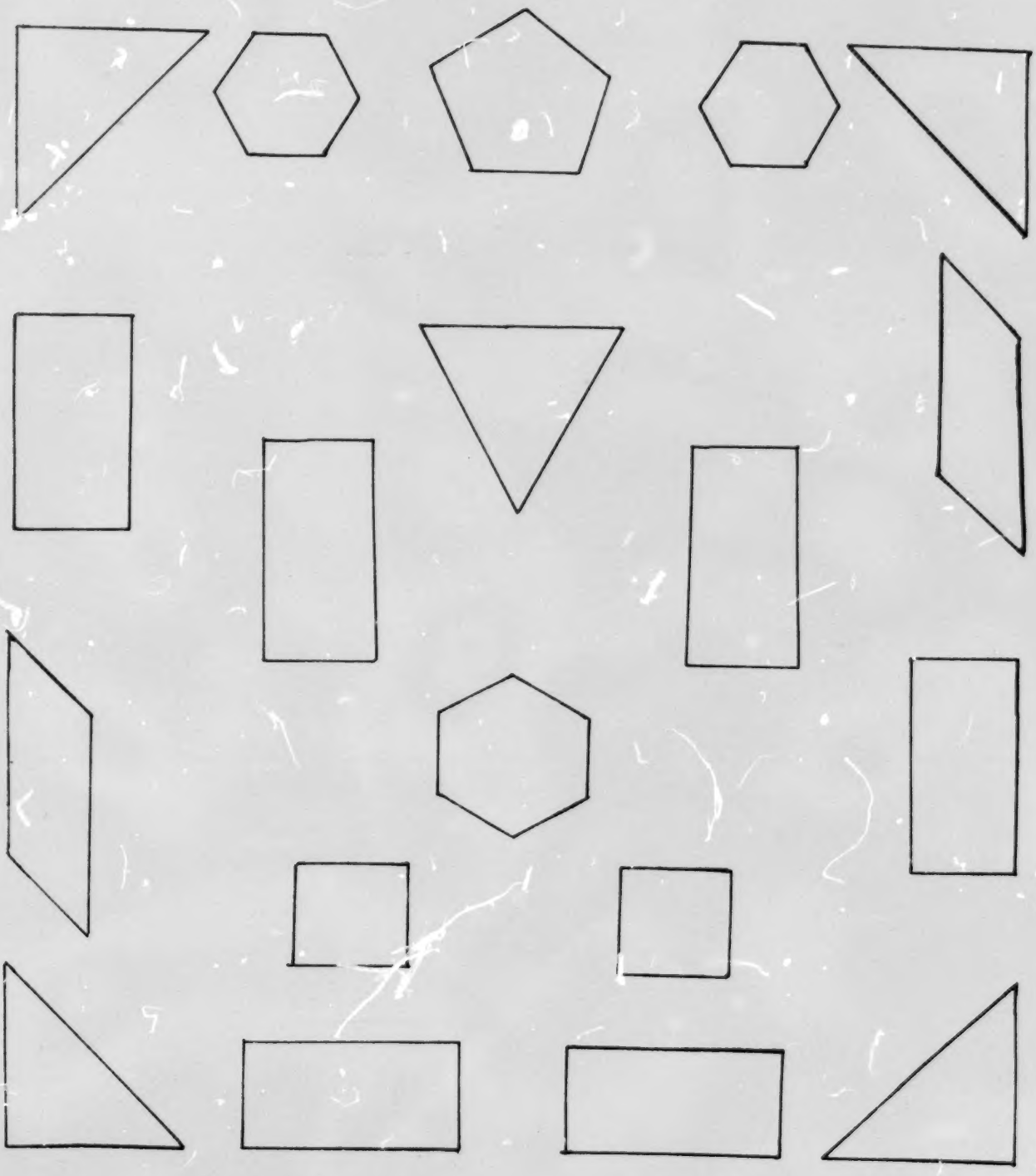
GARDEN PLANTER DESIGN

Another innovative garden design that should be considered is the placement of a series of individual planters atop the ground surface. 2" X 6" boards cut and arranged in symmetrical patterns as shown in the diagram on page 5 contain 6" depths of topsoil. The pattern provides an attractive, accessible work area for students, while allowing through passage without the necessity of fencing.

Orangewood Elementary School - A Case History of Small Garden Planters

Two teachers, Jean Underberg and Betty Kirk, saw the need for incorporating gardening activities into their first and fifth grade class work. They decided that the fifth graders would teach the first grade students gardening. The students and teachers researched gardening methods and decided to use the garden planter techniques. The first grade students, after studying a math

unit dealing with geometrical shapes, chose the designs for their garden plots. Small groups of four to six students were responsible for each plot. A materials list was drawn up, and the pressure treated lumber was purchased with site development funds and mini-grant funds from the Lee County Environmental Education Program. With the help of the school's maintenance supervisors, Lynn Mason and George Miller, the planters were constructed in a variety of geometrical shapes. Topsoil was added and seeds sown. The students chose the type of plants they wanted to grow, and were responsible for cultivation, weeding, and watering throughout the growing season. Various classroom activities relating to gardening were culminated with the harvesting of the various crops. The lunchroom staff prepared and served the vegetables to the students.



III. Garden Equipment and Tools

Parents are often able to lend garden tools to the school, but it is a good idea to have the school purchase the necessary equipment. Equipment that belongs to the school can be used by all students and is available at all times for class work.

When purchasing tools, keep in mind the size of your students. Most of the common gardening tools come in two sizes or styles. A price list should be made, and this can be one of the activities for the class. Have the class contact several local garden centers for price quotations and then select the best bids.

Following is a list of equipment and tools with approximate prices. This list contains all of the items necessary for a class gardening activity.

QUANTITY	ITEM	UNIT COST	TOTAL COST
2	Small floral shovels	4.50	$ 9.00
2	Small floral hoes	2.90	5.80
1	Small floral rake	3.00	3.00
1	5/8 inch size hose (50 ft.)	8.00	8.00
1	Sprinkler "can't beat 'em" model by Nelson Garden Equipment	2.00	2.00
1 bag	25 lbs. Fertilizer (6-6-6) "Sunniland" 100% organic	3.10	3.10
1 bag	Peat moss (4 cubic feet)	6.00	6.00
2 lbs.	"Sunniland Vegetable Dust" combination fungicide and insecticide	2.10	2.10
1	Dust applicator, Hudson Brand	2.50	2.50
		Total	$41.50

If your school has a compost pile (see the section on Composting), the peat moss may be eliminated from the materials list. The compost material can also supplement the cost of topsoil needed to fill the planters.

IV. Garden Vegetables and Flowers

The following five vegetables have been recommended as being among the easiest to grow in South Florida, in that they require the least amount of care, are less subject to disease or insect problems, give quickest return, favor our own soils, and demand no "added" soil treatment.

VEGETABLES

QUANTITY	ITEM	COST per ITEM	TOTAL COST
2	Packages of radish seeds	$ .40	$ .80
2	Packages of carrot seeds	.40	.80
2	Sets of green onions	.40	.80
2	Packages of turnip seeds	.40	.80
2	Packages of lettuce seeds	.40	.80
	(For added color and variety to your garden, we suggest...)		
1	Package of marigold seeds ✓	.40	.40
1	Package of zinnia seeds ✓	.40	.40
6	Sweet pepper plants	.40	2.40
6	Tomato plants	.80	4.80
		Total	$12.00

Suggest these plants to your students explaining that all of them grow well in our area. Allow the students to suggest other vegetables and flowers that they might like to grow. Have the students research such factors as the length of time it takes the plants to yield crops, the distance apart the plants should be placed, and the type of soil necessary for good plant growth. In the booklet section concerning

Fungicides and Insecticides, you will find a discussion on biological controls of pests. This section of the booklet will give you suggestions concerning plants that can help prevent insect pests in your garden, and will enhance the teaching possibilities with your class.

Following is a list of useful information that may save some time for your students in deciding what plants to use. Also read the specific instructions in the Planting Instructions section.

VEGETABLE	DISTANCE BETWEEN PLANTS	ROWS	DAYS REQUIRED TO YIELD CROP	SOIL REQUIREMENTS
Beans, Bush	4"	18"	50-85	Sandy Loam
Beans, Pole	36"	36"	90-100	Sandy Loam
Cabbage	18"	24"	100	Black Loam
Carrots	Thin to 2"	18"	75-80	Sandy Loam
Celery	6"	24"	120	Black Loam
Corn, Sweet	Thin to 12"	30"	70-90	Sandy Loam
Cucumbers	36"	36"	50-55	Sandy Loam
Lettuce	Thin to 12"	24"	50-60	Sandy Loam
Musk Melons (Cantaloupe)	36"	36"	95-120	Sandy Loam
Onions	2"-3"	10"	Scallions 30-40 Bulbs 112-125	Black Loam
Parsley	6"	18"	60	Sandy Loam
Peas	4"	36"	40-60	Sandy Loam
Peppers, Sweet	10"	10"	50-110	Sandy Loam
Pumpkins & Gourds	100"	100"	70-90	Sandy Loam
Radishes	Thin to 1"	12"	21-30	Sandy Loam
Tomatoes	24"	24"	60-90	Sandy Loam
Turnips	Thin to 4"	18"	60-70	Sandy Loam
Watermelons	100"	100"	75-100	Sandy Loam

V. Student Garden Plan

The best gardens generally are those started on paper. Just like the builder of a house goes by a blueprint, so should the gardener follow a carefully thought-out plan.

Have your students make a scale drawing of their garden. Use the information provided in the previous section for row distance and plant distance, plus the specific information for each type of plant found in the Planting Instructions section.

VI. Preparing the Soil

Once the students have done their research and made their plans, and you have purchased the materials and equipment, the class is ready to begin the actual garden work.

A. Students should turn over the soil with shovels for the entire garden. They can bring shovels from home for this occasion. Ideally, planting should not begin until at least three weeks after the soil has been turned. This gives turned under plant growth time to die and rot, and may reduce some disease problems.

1. Although it should not be necessary, you may wish to collect a sample of soil and have it analyzed at the local garden center. They will suggest from the test if the soil needs the additives, lime or dolomite.
2. If your ground has been gardened in any manner previously, you may need to treat the soil against microscopic worms known as "root knot" nematodes. Nematodes in the soil will produce yellow, sickly and stunted vegetables despite proper care. Contact your garden center for the necessary measures against nematodes.

B. The next step is to apply the peat moss and the fertilizer or compost.

1. Peat moss will increase the amount of organic matter in the normally deficient Florida soil. This will be valuable in that it improves the water holding capacity of soil, supplies nutrients, and improves the ease of working soils. You may wish to purchase and use more peat moss than is suggested in this booklet. The more the better.
2. The fertilizer is essential to improve the amount of minerals and nutrients available for the plants to grow. This, too, can be used in excess of the given amounts.
   a) The peat moss should be worked into the soil before you apply the fertilizer. Simply spread the peat moss over the plant beds to a depth of 4"-6". Next, work the peat moss into the soil with shovels, hoes, and rakes. Now the beds should be ready to add the fertilizer.
   b) Your 6-6-6 fertilizer (in reading fertilizer labels, the first number refers to nitrogen, the second to phosphorus, and the third to potash) should be applied to the soil one or two weeks prior to planting. Follow the application directions on the fertilizer package. The fertilizer can be spread over the planting beds and then worked under the soil with a hoe or rake, but the best results will come from pouring the fertilizer in long narrow bands about two inches below and two inches to each side of where the seed will be placed.
      1) If the fertilizer is spread evenly throughout the

planting bed, use about 4 pounds per 100 square feet. If the fertilizer is placed in narrow bands, as described previously, use about ½ pound per 10 feet of row.

2) You will need additional fertilizer as a side dressing at least twice over the growing period of the plant. At such times, sprinkle the fertilizer beside the plant over the root area.

3) Compost material will increase the amount of organic matter in the soil and act in much the same manner as peat moss. See the booklet section concerning Compost Piles.

VII. Planting Instructions

Planting should take place one to two weeks <u>after</u> the fertilizer has been applied to the soil. The students should follow their garden plans and be well versed in the planting instructions for the types of plants they have chosen.

A. Beans, Bush (Snap Beans or String Beans)

Bush beans are a warm weather plant but can be planted year around in South Florida. In northern areas they are planted in late May. They have few insect enemies, and are an easy vegetable to grow. They mature from 50 to 85 days from the date of sowing seeds. These beans grow best in a rich sandy loam soil.

1. <u>How to sow</u>: Place the rows 18 inches apart. Plant the seeds two inches deep and drop seeds four inches apart in the rows. It usually takes five to seven days for the seedlings to push through the soil. A 15 foot row of bush beans will yield about 20 quarts of pods.

2. Cultivation: Beans are descendants of native plants of India and arid America, and thus need cultivation more than watering. As soon as the young plants develop their second pair of leaves, the soil around the plants should be loosened with a hoe. Weeding, hoeing, and hilling are the main needs of beans. Hilling is simply pulling soil from between the rows toward the plants. This keeps the pods off the ground by giving the plant stems support. Always water between the rows and not directly on the plants as this will retard a fungus rust that can attack the plants. Thin the seedlings when they are about 3 to 4 inches high so that the plants are about 4 inches apart in the rows.

Gathering the crop: When the pods are about 4 to 5 inches long, the beans are ready for gathering. Cut the pods from the plants as they reach the correct size; the more often you pick the pods and prevent seeds from forming in them, the longer the plants will bear.

B. Beans, Pole

Pole beans are similar to Bush beans but bear later although they are more prolific. Pole beans require more labor since climbing poles must be provided. Plant pole beans the same time as bush beans and in the same soil type. Instead of planting in rows, build soil hills about 4 to 5 inches high and 12 to 14 inches in diameter. Stick a strong pole about the size of a broom handle into this hill.

How to sow and cultivate:

Plant 4 or 5 seeds around the pole and about 1 inch from the pole. The seeds should be planted about 2 inches deep. Seedlings gen-

erally appear in about six days. Thin the plants so that each hill has three plants. Two weeks later, the young plants should be tied gently to the poles with string. Weed the hills by hand and hoe only between the hills. Harvest the beans the same way as bush beans.

C. Cabbage

Cabbage originated in cold, moist climates and grows best in spring and late summer or in South Florida during the cooler winter months. Wild cabbage is the common ancestor of broccoli, Brussels sprouts, cauliflower, kale, kohlrabi, and many other vegetables.

How to sow: Cabbage needs a rich soil with plenty of humus. Rows should be about 24 inches apart and not more than one half inch deep. Sow about 1 seed per inch along the row. In northern climates the seeds can be sown in hotbeds and then transplanted.

Cultivation: As soon as the seedlings develop their second pair of leaves the plants should be thinned so that they are about 18 inches apart. The plants that were removed can be transplanted to other garden plots. Cabbage is susceptible to cutworms, aphids, and cabbage worms (see the section on Insecticides).

It takes about 100 days for the cabbage to be ready for gathering. The size of the cabbage head will depend on the soil, watering, and type of cabbage.

D. Carrots

In many countries carrots are used as a winter food for livestock because this vegetable stores so well and is so rich in nutrients. Carrots grow well in most soils but do exceptionally well in a rich sandy loam. In the northern parts of the country, carrots planted in the early spring will grow large enough for use in 75 to 80 days,

but the best keeping varieties for winter storage require at least 100 days to reach full size.

How to sow and cultivate: Rows should be placed about 18 inches apart and about one-half inch deep. It generally takes ten days to two weeks for the seedlings to appear. When the seedlings are three to four inches tall, thin out the plants so that there are about two inches between them. Frequent hoeing along the rows is important. Water the soil near the carrot tops and not the foliage. Early varieties will be about two to three inches long and an inch in diameter when ready to harvest.

E. Celery

The use of celery as a vegetable can be traced back to early Greek times. It was used for a tonic as well as a food. Celery seeds require a long germination period and the plants require an abundance of water. This plant grows best in rich, deep loam.

How to sow and cultivate: In northern climates the seeds should be started in hotbeds around mid-February. The seed flats should be kept at about seventy degrees until the seedlings appear and then the temperature should be lowered to sixty degrees to prevent spindly growth. In April, the seedlings should be transplanted into the garden. Place the plants in rows about six inches apart with one inch between the plants. When they form the third or fourth pair of leaves, dig the plants up and cut back the tops to within three inches of their base and prune the roots, leaving them only about two or three inches long. This insures proper development of the stalks. Transplant the pruned plants into rows that are two feet apart with about six inches between each

plant. Make certain that no dirt gets between the stalks or in the heart of the plant. Water the rows and not the foliage. The plants are susceptible to fungus blight (see the section on Insecticides and Fungicides).

In South Florida the seeds may be sown directly in the garden in rows about six inches apart and one half inch deep. When the plants are three or four inches tall, thin them so that they are about one inch apart. After they form the third or fourth pair of leaves, dig the plants up and cut back the tops to within three inches of their base and prune the roots, leaving them only about two or three inches long. Transplant the pruned plants into rows that are two feet apart with about six inches between each plant. Make certain that no dirt gets between the stalks or in the heart of the plant. Water the rows and not the foliage. The celery is susceptible to fungus blight (see the section on Insecticides and Fungicides).

Blanching Celery: Celery stalks must be blanched to insure good flavor. Blanching removes the color from the stalks so that they are white rather than green. The easiest method is to gather the stalks together and then pile soil around the stalks so that it covers all but the upper four or five inches of the plant. Make certain to hold the stalks tightly so that no soil gets down into the heart of the plant.

F. Corn, Sweet

Corn is a true American plant and was cultivated as a food in Mexico and South America before Cortez landed in the Americas. Corn was a favorite food of American Indians as far back as the seventeenth century.

How to sow and cultivate: In northern areas the seeds should be planted in late spring when the soil and air are warm. It usually takes from 70 to 90 days before the corn is ready to eat. A patch of six rows, each 15 feet long, will yield about 15 to 20 dozen ears. In South Florida corn grows best during the fall and winter months. Soil of rich sandy loam or black loam is best. Seeds should be sown in rows, about three inches deep, with two or three feet between the rows. Drop the seeds about three or four inches apart in the row. Seedlings will appear in eight to ten days. Hoe along the rows to break the soil. When the plants are 6 to 8 inches tall, they should be thinned so that they are 12 to 14 inches apart. After about a month, pull the soil to a height of 4 to 6 inches up the stalks on both sides of the row. This helps give the plant support and retains moisture. Water along the rows rather than the foliage itself.

G. Cucumbers

Cucumbers are a favorite fruit in salads and in their pickled form as pickles. Cucumbers require little care once the seedlings are a few inches long. The plants are of a creeping or spreading habit and do require more space than other garden plants. They can be confined to smaller spaces by pinching out the center shoots of the vine. One method of cultivation is to place the young plants in hanging baskets and then pinch out the center shoots as they develop. The hanging baskets make an attractive and useful addition to the areas near the garden. Cucumbers need a sandy loam soil and will mature in between 50 and 55 days.

How to sow and cultivate: Prepare soil hills with plenty of compost in them. The hills should be about 8 to 12 inches tall and 2 to 3 feet in diameter. Space the hills 3 feet apart. Wet the hill, making certain that it is thoroughly soaked. In northern parts of the country the seeds may be planted toward the end of May, but in South Florida, cucumbers can be planted any time. To sow seeds, make a furrow, one half inch deep, running in a circle about 6 inches in diameter around the top of the hill. Scatter about a dozen seeds along the furrow. Cover the seeds and press down firmly. The seedlings will appear in about a week. The seedlings are susceptible to beetles and must be dusted with insecticides (see the section on Fungicides and Insecticides). When the plants have developed their third pair of leaves, thin the hills so that they have two to four plants each. Weed the hills by hand and not by using hoes. Water the hills about once every other day.

H. Lettuce

Lettuce is one of the easiest vegetables to grow, but one of the most difficult to grow right. The secret behind growing perfect heads of lettuce is found in the proper thinning and transplanting of the plants. Lettuce will grow in almost any soil, but does best in sandy loam types. It grows well in cooler climates so it can be planted early in the spring in northern climates and during the winter months in South Florida. Lettuce takes from fifty to sixty days to mature. There are four types of lettuce: loose-leaf types that do not form heads; "butterhead" types that form small heads; crisp-head types that form large heads; and the Romaine

types that do not form heads.

How to sow and cultivate: Sow seeds in rows, two feet apart, covering the seeds one half inch deep. Drop about two or three seeds per inch. Within three weeks after the seeds are sown, the seedlings should be two or three inches tall. Thin the plants so that they are about two inches apart at this time. After another week thin the plants so that there are about four inches between them. The pulled up plants can be transplanted to another section of the garden. The thinning process should continue so that at no time do the plants touch, let alone crowd each other. A final distance of one foot apart in the row is about right for most of the head lettuce types.

I. Musk Melons (Cantaloupe)

Cantaloupe are natives of Asia and Africa and require warm weather, but grow very well in most of the United States. Melons require a long growing season and may take from 95 to 140 days to mature, depending on the variety.

How to sow and cultivate: Follow the same procedures for sowing and cultivating musk melons as you would for cucumbers. Musk melons, like cucumbers, are susceptible to beetles as well as aphids and rust disease (see the section on Fungicides and Insecticides for help). If plants are heavily infested with rust, it is best to pull them up and destroy them.

When to pick: Smooth skinned melons are ready to pick when the stem that joins the fruit to the vine begins to crack around the edges next to the melon and a slight twist will separate the two.

J. Onions

Onions have been used as a food for man since the dawn of civilization. The laborers who erected the Pyramids for the Pharaohs in 4200 B.C. were fed bread and onions. Onions will grow almost anywhere in this country, in almost any type of soil, and will form scallions in approximately 35 days and large bulbs in 125 days. The white varieties are the earliest and mildest; the yellow types are stronger and the red types are the largest and best keeping of the onions. The best onions are grown in rich, black loam, but sandy loam soils also produce good onions.

How to sow and cultivate: Onions can be grown from seeds or from sets. Sets are available from garden supply stores, and are simply stunted onion bulblets grown the previous year. In northern areas the sets are planted in early April, but in South Florida they may be set out in the winter. Plant the onion sets in rows that are 10 inches apart and place the sets three inches apart and two inches deep in the rows. They will form scallions within 30 to 40 days and can be picked then or allowed to mature into bulbs within 112 to 125 days.

To grow onions from seeds, make furrows about one half inch deep and ten inches apart. Sow the seeds about three or four to the inch along the furrow and cover with soil. The seedlings will appear within two weeks. At this time you should hoe along the rows breaking the soil. It is important to weed and loosen the soil during this time. About six weeks after sowing the seeds, the plants will be four to six inches tall. Thin the plants so that they stand four inches apart in the rows. The pulled out

plants can be transplanted to other parts of the garden. When transplanting, prune the leaves within three inches of the base and then plant them about four inches apart in the new rows.

Harvesting: When the onion leaves show signs of dying by turning yellow, pull up the bulbs. Tie about a dozen bulbs together by bunching the leaves together and tying a piece of string around the leaves. Hang the onions in a dry area that has good air circulation for about a week. This allows the bulbs to ripen and dry out. Cut the leaves to within three or four inches of the bulb and the onions are ready to be used or stored.

K. Parsley

Parsley is used as a garnish or in soups and stews. Some people grow parsley as an ornamental plant because of its symmetrical growth pattern. Parsley will grow throughout the United States. The seeds must be sown early in the spring in the northern areas and will grow best in South Florida if planted during the winter.

How to sow and cultivate: Rows should be 18 inches apart and one quarter inch deep. Drop the seeds so that there are one or two per inch. It will take as much as a month for the seedlings to appear. When the plants are two or three inches tall, thin them so that they stand about six inches apart.

L. Peas

Peas are easily grown, but require considerable space in a garden so as to enable the gardener to gather enough pods for a meal at one picking. Peas grow well in most soils and very well in sandy loam types. The dwarf varieties are best for most gardens but the tall varieties will bear longer. All peas grow better if they are given a trellis or fence on which to cling. According to the nature of the dry seeds, peas are divided into

smooth-seeded and wrinkled-seeded types. The smooth-seeded varieties are the hardiest and can be planted early in spring in northern climates. The wrinkled peas are best sown later in the year, around May.

How to sow and cultivate: Sow in rows, two or three inches deep, dropping two or three seeds per inch. The row should be along a fence or have a trellis by it. Rows should be at least two feet apart. Seedlings will appear in approximately one week. Weeding and hoeing are important since pea roots need air. Pods will begin to form in forty to sixty days. The average pea plant yields about 6 to 12 pods; thus it takes a large number of plants to yield enough peas for a meal. When the pods are about three inches long, they are ready for picking. Water the roots, not the foliage.

M. Peppers, Sweet

Sweet peppers or "mangoe" peppers originated in East India and, thus, many varieties will only grow in warm climates. Pepper seeds are fairly difficult to germinate, so it is best to buy small pepper plants from the garden supply or nursery.

How to plant: Peppers grow best in a sandy loam with good drainage. If the soil is too rich, the plant will grow well, but not produce good fruit. In the North, plants should be set out in early June, but in South Florida, they can be grown year around. Rows should be about two feet apart with 18 inches between the plants in the rows. Weed and hoe regularly and do not over-water. It will take about 50 to 60 days before the fruit is ready.

Growing from seed: In northern areas the seeds are sown late in February in a hotbed or greenhouse. In South Florida sow any time

outdoors. Sow the seeds thickly and transplant the seedlings when they are about one or two inches tall. The seedlings can be transplanted directly into rows outdoors if it is warm enough, or put in small paper cups for later planting. In Florida, thin the rows so that plants are 18 inches apart.

N. Pumpkins and Gourds

Pumpkins require rich soil, a long growing season and a large amount of space. They are not recommended for small gardens. Usually, pumpkins and gourds are grown as a by-product of the corn field, or in some isolated fence corner where the vines can spread without restraint.

How to sow and cultivate: Prepare soil hills about two to three feet in diameter and about one foot high. Place six to ten seeds in the well watered hill and, after the seedlings appear, thin the plants so that each hill has two plants. The hills must be about 9 feet apart. In the North, do not plant seeds until June. The plants need plenty of moisture, so water at least twice a week.

O. Radishes

Radishes have been used for food for thousands of years. Chinese books more than three thousand years old refer to this vegetable. Radishes are probably the easiest of all vegetables to grow. They grow well in all soil types and almost all climates. They come in a variety of sizes and shapes and there are specific varieties for different seasons. Some radish varieties are ready to eat within three weeks of planting the seeds.

How to sow and cultivate: Rows should be 12 inches apart and one quarter inch deep. Drop seeds so that there are only two seeds per inch of row. When the seedlings develop their second or third pair of leaves, thin the rows so that the plants are about two inches apart. Be careful when weeding and hoeing not to loosen the soil near the plants as this will stop growth. The round type of radish is the fastest growing and is ready for eating within three weeks. Olive-shaped radishes take about four weeks and the long radishes are ready in about five weeks. There are red and white varieties of the round, olive-shaped and long types of radishes.

P. Tomatoes

The tomato originated in the Americas, probably in Peru. Since those early days, tomatoes have been cultured and hybridized until today we have over 500 different varieties. During the nineteenth century, the tomato was thought to be a poisonous weed by many white men, but Indians throughout South America knew it as a useful food. Tomatoes are a long season plant and, when grown from seed, may take more than 100 days to mature. They are also susceptible to frost so, in the northern areas of the country, they must be started in hotbeds or greenhouses.

How to sow and cultivate: In northern areas, sow seeds in late February in seed flats. In South Florida, it is best to start the plants in seed flats, too. They should be one-quarter inch deep, and the soil kept moist. Seedlings will appear in about 10 days. When the second pair of leaves appears, transplant the seedlings into single paper pots. As soon as frost danger is past,

remove the paper pot and place the plants in rows two feet apart. The plants should be placed two feet apart along the row. Water the rows and not the foliage. After about four weeks the plants will be two or three feet tall. Tie the plants up by pushing wooden stakes into the soil next to the plant and loosely tying the plant to the stake. This prevents the tomato fruit from touching the ground and rotting. If the plants produce a large number of branches, prune off all but three of the strongest branches.

Small tomato plants 2 to 4 inches tall can be purchased from local gardeners or garden supply stores to shorten the time and effort involved in growing tomatoes. Place the plants 2 feet apart in rows that are 2 feet apart. Stake, prune and water just as described in the previous paragraph.

Q. Turnips

The first known reference to turnips was made by the Greeks more than two thousand years ago. Turnips are one of the vegetables that were used for both cattle and humans because they store well. Turnips grow well in sandy loam soils and can be gathered within 60 to 70 days after sowing the seeds. They grow best in cooler climates and must be grown during the coolest winter months in South Florida. In northern areas, they can be planted early in the spring and early in the fall, but do not do well during hot summer months. They need plenty of water and prolonged drought makes them subject to disease.

How to sow and cultivate: Sow seeds so that no more than two per inch are dropped. The rows should be 18 inches apart, and the seeds should be planted one half inch deep. As soon as the seed-

lings are two to three inches apart, thin the rows so that the plants are four inches apart. Hoe along the rows once a week. The early varieties will be ready to pick in 60 days, while later varieties take 75 to 80 days.

R. Watermelons

The natives of Africa and tropical Asia have eaten watermelons for thousands of years. They were brought to this country by the early slaves, and, since that time, have been spread throughout the warm climate areas of the world. They grow best in sandy loam soils. Watermelons take plenty of room, so they are not recommended for small gardens. They mature between 75 and 100 days, depending on the variety and weather conditions.

How to sow and cultivate: Follow the same procedure as Muskmelons except that the hills must be nine feet apart.

VIII. A note on Watering, Weeding and Cultivating

Water is essential to any garden. Soils that are sandy will need more water than soils containing high amounts of organic matter, such as manure, peat moss, and/or compost. It is best to use a hose with a sprinkler head when watering, especially in the early stages of plant development. The sprinkler head will prevent the soil, seeds and seedlings from being disturbed. Never water the foliage of any plants, as this will increase the chance and spread of fungal and bacterial diseases. Always water below the foliage and near the plant stems. The frequency of watering will depend on the soil type and the type of plants in the garden. The soil should be kept moist, but not soggy wet.

Weeding the garden is another essential task, as weeds not only compete for space and light with your vegetable crops, but also remove large amounts of soil minerals and nutrients. Whenever weeds are near the plants, remove them by hand rather than using tools. Weeds in between plant rows can be removed either by hand or by using hoes.

Cultivating the soil is important as it breaks the surface crust and allows air to penetrate to the plant roots. All plants need a good supply of oxygen to their root systems. Hard packed or overly watered soil prevents oxygen penetration, thus the soil near the plants should be kept loose except in the case of radishes and turnips (see the section on Planting Instructions).

IX. Fungicides, Insecticides and Biological Controls

All gardens produce food for not only man, but for insect pests, fungi and bacteria. The gardener must control the plant and animal pests in order to obtain the best crop results. Many pesticides are not only hazardous to the pests we are trying to eliminate, but they are dangerous to us and our students. Never try to completely eliminate insects from the garden; some of them are useful. Essentially, there are two main ways to control pests: using chemicals, and using biological controls. This section of the booklet will present ideas and suggestions concerning each of these. Much of this material was gathered from Pesticides and Your Environment, A Guide for the Homeowner and Home Gardener, by John Cary Stone, a publication of the National Wildlife Federation.

A. Suggestions for Safer Pesticide Use:

1. Use pesticides only when necessary.
2. Follow the instructions on the label and always use the least amount of pesticide required.

3. Use specific pesticides for specific pests.
4. Buy the minimum amount necessary for the job. Do not store around children.
5. Keep pesticides in their original containers.
6. Mix only the amount needed and never mix in any container that will be used for something else later.
7. Do not breathe vapors or dusts. Keep off the skin also.
8. Liquid sprays are safer than dusts since they do not drift as much.
9. Do not allow puddles of water to form in the garden as these will accumulate pesticides. Animals and pets drinking from these puddles will be poisoned.
10. Dispose of pesticide containers by making them useless as containers. Puncture cans, break glass bottles and wrap both in layers of securely tied newspaper.

B. Controlling Pests.

1. Biological Controls, Companion Planting and Mechanical Controls

In nature, diversity helps insure the success of a natural system. The same rule of diversity holds true for a garden. Some insects eat plants and some insects eat other insects; thus, if the garden has a variety of plants, it will attract a variety of insects, many of which are helpful to the gardener. Birds will also be attracted to the areas and the small amount of plant loss due to the birds will be far outweighed by the benefits of birds' eating insects. Ladybugs, green lacewings and praying mantises are all helpful insect predators, and should be released in the garden. They will help control such

pests as aphids, scale insects, mites, insect larvae, and insect eggs.

Companion planting is another useful biological control. Some plants seem to have the ability to keep insect pests away from other plants near to them. Marigolds planted near tomatoes and other garden vegetables will help control soil nematodes, grubs and insect larvae that eat plant roots. Flowering parsley attracts advantageous insects in their adult stages. These adult insects will prey on many of the common garden pests. Spearmint will deter cabbage moths from laying eggs in your garden. Pyrethrum is a good plant to help control aphids. Rosemary will deter both the Mexican bean beetle and the cabbage moth. Thyme also protects a garden from cabbage moths. Geraniums planted in the garden will attract Japanese beetles away from other plants so that you can then pick them off the geraniums. Onions and garlic plants will repel mice and moles, Japanese beetles and aphids. Leeks and chives repel the carrot fly. Sage planted between vegetable rows appears to offer protection against cabbage looper and carrot fly. (Following is a list of places from which helpful insects may be purchased:

Ladybugs - Bio-Control Company, Box 2397, Route 2, Auburn, California 95603;
Schnoor's Sierra Bug Company, P. O. Box 114, Rough & Ready, California 95975.

Green Lacewings - Rincon Insectary, 6349 Riverside Avenue, Riverside, California;
Vitova Company, Inc., P. O. Box 475, Rialto, California;
Ecological Insect Services, 15075 West California Avenue, Kremin, Calif. 93630; and other suppliers.

Praying Mantises - Robert Robbins, 424 North Courtland Street, E. Stroudsburg, Pennsylvania 18301;
Mincemoyer's Nursery, R. D. 5, Box 379, New Prospect Road, Jackson, New Jersey 08527;
Bio-Control Company, Box 2397, Route 2, Auburn, California 95975;
and other suppliers.

Mechanical control is simply spending time removing insects from the plants by hand. Another method is to place a small shallow pan of stale beer level with the ground near where you have a problem with snails and slugs. The snails and slugs will die in the liquid. Cutworms are a common pest in gardens, especially those that have been made in lawn areas. The best method of protecting your plants from this worm is to construct rings of stiff paper or cardboard. Place these rings to within two inches of the plant base, encircling it completely, and push into the soil about one inch.

Biological, mechanical and companion planting are the best environmental and safest methods of controlling insect pests in the garden. Usually, your students will find these methods more interesting than other procedures. A "garden food web" can be constructed showing predators, prey and producers.

C. Chemical Controls

One of the best combination fungicides and insecticides using chemicals is called "Sunniland Vegetable Dust" (2 lbs. about $2.00). Consult a local garden center for information on this product. Other chemical compounds that can be used, but only when absolutely necessary, are as follows:

COMPOUND	USED TO CONTROL
Rotenone	thrips, caterpillars, diabrotica, cabbage worm
Pyrethrins (c: Allethrin)	aphids, leafhoppers, thrips, whitefly, diabrotica, cabbage worm, bean beetles
Sulfur	mites and as a fungicide
Lime Sulfur	aphids, scale, and other soft bodied insects
Ryania	codling moths, leafhoppers, squash bugs
Sabadilla	stink bugs, chinch bugs, cabbage bugs
Summer Oils	scale crawlers, mites
Bacillus Thuringiensis	leaf eating caterpillars
Milky Spore Disease	Japanese beetle grubs
Bordeaux Mixture (Do Not use mixtures containing lead or arsenic)	leafhoppers and other soft bodied insects as well as acting as a fungicide

The Bordeaux Mixtures containing calcium hydroxide or copper sulfate and the "Sunniland Vegetable Dust" are probably the best all-around combination pesticides for school use.

Pesticides that should be used only when absolutely necessary (this is when your garden is so infested with pests that you can hardly see the plants!) are as follows:

(Only when absolutely necessary)

COMPOUND	USED TO CONTROL
Methoxychlor	cabbage worm, bean beetle, thrips, leafhoppers
Diazinon	aphids, leafhoppers, mealybugs, scale crawlers, spittle bugs, thrips, whitefly, caterpillars, diabrotica, grasshoppers, cutworms, grubs, wireworms, leaf miners
Malathion	aphids, leafhoppers, thrips, mites, spittlebugs, caterpillars, scale crawlers

Following is a list of pesticides that should NEVER be used by the home or school gardener. They are too dangerous to both humans and other animals:

Lindane

Aldrin

BHC (Benzene hexachloride)

Chlordane

DDD (Dichloro diphenyl dichloroethane)

DDT (Dichloro diphenyl trichloroethane)

Dieldrin

Endrin

Heptachlor

Toxaphene

Arsenic (will appear on label as calcium arsenate, sodium arsenate or Paris green)

Mercury (will appear as a mercury compound such as phenyl mercury acetate)

Dinitro cresol

(NEVER use.)

Captan

Folpet

Antu (appears as alpha nephyl thio urea)

2, 4-D (2, 4 dichlorophenoxy, acetic acid)

2, 4, 5-T (2, 4, 5 trichlorophenoxy acetic acid)

Nicotine sulfate

Carbaryl

Parathion

Methyl parathion

D. One last thing to remember: students should always wash their hands after working in any garden where chemical pesticides have been used. Indoctrinate your students on the dangers of pesticides and remind them to keep their fingers away from their eyes, nose, ears, and mouth while working in the garden. Wash all vegetables and fruit thoroughly before allowing students to eat them.

X. Protecting the Garden Site.

If the garden site is off the beaten path and the school has a small enrollment, a simple fence of the wooden ranch style may suffice. If the garden is in a more conspicuous area, chain-link fence four feet high with a corner gate may be necessary. The fencing can be by far the most expensive part of your garden. Some schools will find that fencing is not an absolute necessity. The need for a garden fence is best judged by the personnel at the school.

XI. Composting and Compost Piles

Good soil is the crucial factor in plant health. Soil is a mixture of air, water, minerals, microorganisms, and decayed organic

matter (plant material). Humus is decayed organic matter and aids in the retention of moisture. In South Florida our soils are very sandy. By mixing humus with the sand the gardener can produce a soil mixture called sandy loam.

An economical and interesting method of producing humus material for garden use is by making a compost pile. Composting takes time, so start early in the school year and add to the pile throughout the year. The compost pile may be left over the summer and humus material will be waiting for the next school year.

For rapid composting, make a well-ventilated base of branches or wire. Add successive layers of:

1. Plant wastes (leaves, grass clippings and food wastes from the cafeteria);
2. Cow manure or chemical fertilizer;
3. 2 to 3 inches of soil;
4. A sprinkling of lime.

Repeat these layers to a height of 4 feet. The pile can be as long as you wish but a 6 foot long compost pile should be enough.

To increase the speed of the composting, sprinkle a cupful of septic tank activator, such as Septic Tank Aid by Amway, on the pile, and mix it in with the composting material. This activates the soil with bacteria that increase the speed of decomposition.

Keep the pile moist and make a depression on top to hold water. Turn the pile about once a month. The pile may be contained by a chicken wire or cement block frame. Small amounts of compost can be made in a heavy plastic bag or any other container.

When the material is broken down and has a sweet smell (or does

not smell like rotting plant material), it is ready to be mixed with the garden soil.